## CLAIMS

1. An azimuth measurement device comprising:

2- or 3-axis geomagnetism detection means for detecting the geomagnetism;

output data acquisition means for acquiring repeatedly a predetermined number of times or more, either the 2-axis output data at the time when the direction of the geomagnetism detection means changes while keeping the 2-axis detecting directions on a predetermined plane, or the 3-axis output data at the time when the direction of the geomagnetism detection means changes in the three-dimensional space;

reference point estimation means for determining a reference point either on 2-axis coordinate space composed of the 2-axis output data or on 3-axis coordinate space composed of the 3-axis output data thereby to estimate the coordinates of the reference point by a statistical method so that the dispersion of the distances from the 2- or 3-axis output data group obtained by the output data acquisition means, to the reference point may be minimized;

offset information calculation means for calculating the offset information of the output data of the geomagnetism detection means on the basis of the coordinates of the reference point by the reference point estimation means; and

first reliability information calculation means

relating to the reliability of the offset information calculated by said offset information calculation means,

wherein the acceptance threshold value at the time of calculating said offset information is gradually tightened on the basis of the basis of the first predetermined number of the recent first reliability information calculated by said first reliability information calculation means.

2. An azimuth measurement device according to claim 1, further comprising second reliability information calculation means relating to the reliability of the offset information from the output data acquired latest, wherein an acceptance threshold value at the time of calculating said offset information is loosened, in case the reliability deteriorates, on the basis of second reliability information of the recent second predetermined number calculated by said second reliability information calculation means.

3. An azimuth measurement device according to claim 1,

wherein not only the acceptance threshold value at the time of calculating said offset information but also the data measurement conditions and/or the offset information calculation conditions are changed.

4. An azimuth measurement device according to claim 1, 2 or 3,

wherein said first reliability information is calculated from the dispersion of the recent reference point.

5. An azimuth measurement device according to claim 1, 2 or 3,

wherein said first reliability information is calculated from the dispersion of the data of said closes 2- or 3-axis output data group.

6. An azimuth measurement device according to claim 2 or 3,

wherein said second reliability information is the distance from the 2- or 3-axis output data obtained by said output data acquisition means, to the reference point.

7. An azimuth measurement device according to claim 2 or 3,

wherein said second reliability information is calculated from a geomagnetic inclination angle information calculated from the 3-axis output data obtained by said output data acquisition means.

8. An azimuth measurement device according to claim 3, wherein said data measurement condition value and/or

said offset information calculation condition contains a measurement time interval.

9. An azimuth measurement device according to claim 3, wherein said data measurement condition value and/or said offset information calculation condition contains number of data for calculating the offset information.

10. An azimuth measurement device according to claim 3, wherein said data measurement condition value and/or said offset information calculation condition contains said first and/or second predetermined number.

11. An azimuth measurement device according to claim 1, 2 or 3, further comprising first and second external output means for outputting said first and second pieces of reliability information to the outside.

12. An azimuth measurement device according to claim 3, further comprising: third reliability information calculation means for calculating third reliability information from said data measurement condition value and/or said offset information calculation condition; and third external output means for outputting said third reliability information from said third reliability information calculation means.

13. An azimuth measurement device according to claim 1, 2 or 3, further comprising detection means for detecting a specific event, wherein the acceptance threshold value at the time of calculating the offset information in case said event occurs are changed.

14. An azimuth measurement device according to claim 1, 2 or 3,

wherein said specific event is a specific operation by an operator.

15. An azimuth measurement device comprising:

3-axis geomagnetism detection means for detecting the geomagnetism;

output data acquisition means for acquiring the 3-axis output data at the time when the direction of said geomagnetism detection means changes in the three-dimensional space, repeatedly a predetermined number of times or more;

reference point estimation means for determining a reference point on three-dimensional coordinates composed of said 3-axis output data, to estimate the coordinates of the reference point from the 3-axis output data group obtained by said output data acquisition means;

offset information calculation means for calculating the offset information for the output data of said geomagnetism detection means on the basis of the

coordinates of said reference point by said reference point estimation means; and

second reliability information calculation means relating to the reliability of the offset information from the output data obtained latest by said output data acquisition means,

wherein the second reliability information calculated by said second reliability information calculation means is calculated from both the geomagnetic inclination angle information expected with the premise that the azimuth measurement device is horizontally held and the geomagnetic inclination angle information calculated from the output data acquired latest by said output data acquisition means.

16. An azimuth measurement device comprising:

2- or 3-axis geomagnetism detection means for detecting the geomagnetism;

output data acquisition means for acquiring several times or more, either the 2-axis output data at the time when the direction of said geomagnetism detection means changes while keeping said 2-axis detecting directions on a predetermined plane or the 3-axis output data at the time when the direction of said geomagnetism detection means changes in the three-dimensional space;

reference point estimation means for estimating the coordinates of the reference point by a statistical method

so that the dispersion of the distances from selected 2- or 3-axis output data group to the reference point may be minimized; said reference point estimation means also selecting said 2- or 3-axis output data on the basis of predetermined measurement parameters, and also determining a reference point either on the two-dimensional coordinate composed of said selected 2-axis output data or on the three-dimensional coordinates composed of said selected 3-axis output data;

offset information calculation means for calculating the offset information for the output data of said geomagnetism detection means on the basis of a plurality of reference points estimated by said reference point estimation means;

azimuth calculation means for calculating an azimuth from said output data and said offset information; and

reliability information calculation means for calculating the reliability information of said offset information according to calculation parameters for calculating the reliability information of predetermined offset information, on the basis of at least one of said 2- or 3-axis output data group and said plural reference points.

17. An azimuth measurement device according to claim 16,

wherein said offset information calculation means compares said reliability information with an acceptance

threshold value to evaluate whether or not said reliability information is to be adopted as the offset information to be used for the calculation of the azimuth by said azimuth calculation means.

18. An azimuth measurement device according to claim 17,

wherein said acceptance threshold value is changed more strictly as said offset information is adopted a predetermined number of times.

19. An azimuth measurement device according to claim 17, further comprising a detection section for detecting the magnetic environment inside and outside of the azimuth measurement device and the change in said magnetic environment,

wherein said acceptance threshold value is loosened in case said detection section detects that said magnetic environment has changed.

20. An azimuth measurement device according to claim 19,

wherein said detection section detects that the magnetic environment has changed, in case the data acquired by said output data acquisition means exceeds a predetermined range.

21. An azimuth measurement device according to claim 17, further comprising:

event detection means for detecting either the change in the environment of the azimuth measurement device or the operation of the operator,

wherein said acceptance threshold value is changed in case said event occurs.

22. An azimuth measurement device according to claim 21,

wherein said environment change is a temperature change.

23. An azimuth measurement device according to any of claims 18 to 22,

wherein at least one of said measurement parameters and said calculation parameters are changed, when said acceptance threshold value is changed.

24. An azimuth measurement device according to any of claims 16 to 23,

wherein the reliability information of said offset information contains the information calculated from the dispersion of the plural reference points.

25. An azimuth measurement device according to any of claims 16 to 23,

wherein the reliability information of said offset information contains the information calculated from the dispersion of the data composing said 2- or 3-axis output

data group.

26. An azimuth measurement device according to any of claims 16 to 23,

wherein the reliability information of said offset information contains the distance from the 2- or 3-axis output data obtained by said output data acquisition means, to the reference point.

27. An azimuth measurement device according to any of claims 16 to 23,

wherein said measurement parameters contain a measurement interval.

28. An azimuth measurement device according to any of claims 16 to 23,

wherein said measurement parameters contain the variation in data,

wherein said variation is the difference between the output data acquired by said output data acquisition means and the data selected by said reference point estimation means, and

wherein said reference point estimation means selects the data, of which said variation is at a predetermined value or higher.

29. An azimuth measurement device according to any of claims 16 to 23,

wherein said measurement parameters contain the number of data for said reference point estimation means to estimate the coordinates of the reference point.

30. An azimuth measurement device according to any of claims 16 to 23,

wherein said calculation parameters contain the number of reference points for calculating the dispersion of said reference points.

31. An azimuth measurement device according to any of claims 16 to 30, further comprising output means for outputting at least one of said acceptance threshold value, said measurement parameters and said calculation parameters to the outside.

32. An azimuth measurement device according to any of claims 16 to 31,

wherein said geomagnetism detection means acquires 3-axis output data,

further comprising:

information acquisition means relating to the posture angle of the azimuth measurement device; and

geomagnetic inclination angle information calculation means for calculating geomagnetic inclination

angle information from said output data, said offset information and the posture angle,

wherein said azimuth calculation means calculates the azimuth of the device from said output data, said offset information, and the information relating to said posture angle, and

wherein the index of reliability of the azimuth to be calculated is calculated from the value of said geomagnetic inclination angle information.

33. An azimuth measurement method comprising:

the step of acquiring, by using 2- or 3-axis geomagnetism detection means for detecting the geomagnetism, either the 2-axis output data at the time when the direction of said geomagnetism detection means changes or the 3-axis output data at the time when the direction of said geomagnetism detection means changes in the three-dimensional space, a plurality of times or more while keeping said 2-axis detecting directions on a predetermined plane;

the step of selecting said 2- or 3-axis output data on the basis of predetermined measurement parameters;

the step of determining a reference point either on the two-dimensional coordinate composed of said selected 2-axis output data or on the three-dimensional coordinates composed of said selected 3-axis output data, thereby to estimate the coordinates of the reference point by a

statistical method so that the dispersion of the distances from said selected 2- or 3-axis output data group to the reference point may be minimized;

the step of calculating the offset information for the output data of said geomagnetism detection means on the basis of said plural reference points estimated;

the step of calculating an azimuth from said output data and said offset information; and

the step of calculating the reliability information of said offset information according to calculation parameters for calculating the reliability information of predetermined offset information, on the basis of at least one of said 2- or 3-axis output data group and said plural reference points.

34. An azimuth measurement method according to claim 33,

wherein said offset information calculation step compares said reliability information with an acceptance threshold value to evaluate whether or not said reliability information is to be adopted as the offset information to be used for the calculation of the azimuth.

35. An azimuth measurement method according to claim 34,

wherein said acceptance threshold value is changed more strictly as said offset information is adopted a predetermined number of times.

36. An azimuth measurement method according to claim 34, further comprising:

the step of detecting that the magnetic environment inside and outside of the azimuth measurement device has changed; and

the step of loosening said acceptance threshold value in case it is detected that said magnetic environment has changed.

37. An azimuth measurement method according to claim 36, wherein said detection step detects that the magnetic environment has changed, in case the data acquired exceeds a predetermined range.

38. An azimuth measurement method according to claim 34, further comprising:

the step of detecting either the change in the environment of the azimuth measurement device or the operation of the operator; and

the step of changing said acceptance threshold value in case said event occurs.

39. An azimuth measurement method according to claim 38, wherein said environment change is a temperature change.

40. An azimuth measurement method according to any of claims 35 to 39,

wherein said acceptance threshold value is changed, and

wherein at least one of said measurement parameters and said calculation parameters are changed.

41. An azimuth measurement method according to any of claims 33 to 40,

wherein the reliability information of said offset information contains the information calculated from the dispersion of the plural reference points.

42. An azimuth measurement method according to any of claims 33 to 40,

wherein the reliability information of said offset information contains the information calculated from the dispersion of the data composing said 2- or 3-axis output data group.

43. An azimuth measurement method according to any of claims 33 to 40,

wherein the reliability information of said offset information contains the distance from the 2- or 3-axis output data obtained by said output data acquisition means, to the reference point.

44. An azimuth measurement method according to any of claims 33 to 40,

wherein said measurement parameters contain a measurement interval.

45. An azimuth measurement method according to any of claims 33 to 40,

wherein said measurement parameters contain the change in data,

wherein said change is the difference between the output data acquired by said output data acquisition means and the data selected by said reference point estimation means, and

wherein said reference point estimation means selects the data, of which said change is at a predetermined value or higher.

46. An azimuth measurement method according to any of claims 33 to 40,

wherein said measurement parameters contain the number of data for estimating the coordinates of the reference point.

47. An azimuth measurement method according to any of claims 33 to 40,

wherein said calculation parameters contain the number of reference points for calculating the dispersion

of said reference points.

48. An azimuth measurement method according to any of claims 33 to 47, further comprising the step of outputting at least one of said acceptance threshold value, said measurement parameters and said calculation parameters to the outside.

49. An azimuth measurement method according to any of claims 33 to 48,

wherein said geomagnetism detection step acquires 3-axis output data,

further comprising:

the step of acquiring information relating to the posture angle of the azimuth measurement device; and

the step of calculating geomagnetic inclination angle information from said output data, said offset information and the information relating to the posture angle,

wherein said azimuth calculation step calculates the azimuth of the device from said output data, said offset information, and the information relating to said posture angle, and further comprising:

the step of calculating the index of reliability of the azimuth to be calculated is calculated from the value of said geomagnetic inclination angle information.